EVALUATING SITE INDUCTION PRACTICE EFFICIENCY AND EFFECTIVENESS - AN ORGANISATIONAL CASE STUDY

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The style of induction presentation and other processes, irrespective of duration, immediately establishes the context and attitude of the construction site team and is where initial behavioural standards are established. A case study within a large contractor investigates site induction activities in practice to better understand the operational demands on time for those involved in managing site inductions and the impact of this activity on safety behaviour on site. The research method adopted was a desk-based review of company policy through document analysis, observations of site induction practice, operations and semi structured interviews. Trade-offs between time losses/benefits, safety in practice, technology implementation and their impact on administrative processes are examined. It is argued that the use of observations has allowed the identification of the actual time commitment in practice. The principal contractor's allocated time for providing and undertaking site induction activities was underestimated by 16% to 20%. There is potential to save time through exploitation of existing and new technology solutions more fully. However, those with an H&S leadership role have indicated difficulties in keeping up with the pace of change in technology development for this purpose.

Keywords: practice, leadership, lost time, safety, site induction

INTRODUCTION

Konstantin *et al*., (2010) identified that the most frequently measured safety issues in the US were management commitment to safety followed by supervisor competence, priority of safety over production and time pressure, considerably less is known about other constructs that contribute to effective safety on sites. There are similarities with the UK context (Sawacha *et al*., 1999) where the top five important issues found to be associated with site safety were: (1) management talk on safety; (2) provision of safety booklets; (3) provision of safety equipment; (4) providing safety environment and (5) appointing a trained safety representative on site.

The safety principle of prevention, evident in the research findings indicates the importance of pre-project planning, role of leadership, inductions/orientations and training (Hinze and Wilson, 2000; Nga *et al*., 2005). The literature acknowledges the importance of site inductions, however, the investigations to date have not focused on the key area of site induction practice and tend to focus more on in-principle rather than in-practice. This paper investigates site induction activities in practice to better understand the operational issues for those involved in managing site inductions and the impact of this activity on safety behaviour on site. The issues surrounding trade-offs between task

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This paper was presented as a working paper at the ARCOM 2017 Conference, Cambridge, UK, 4-6 September 2017. Please contact the authors before citing

priorities, the role for leaders in safety practice, and opportunities to make more use of existing and developing technology (e.g. CSCS and PAS 1192-6) and their impact on administrative processes are examined. Findings of the case study are then presented and discussed comparing practice with theory.

SAFETY PRACTICES ON CONSTRUCTION SITES

Trade-off between priorities

Previous studies confirm that there is evidence that site inductions have an impact on site safety behaviour (Tam and Fung, 1998; Peckitt *et al*., 2004; Spillane and Oyedele, 2013) but none of the studies examine the factors influencing the effectiveness of site inductions and emphasise mainly the principles rather than practices. Site inductions are one of several methods construction companies undertake to reduce fatality statistics and maintain their commitment to keeping their track record in health & safety. Usually on-site inductions are split into two parts; the first part contains a general introduction to the health & safety protocol implemented by the company whilst the latter part of the induction incorporates the site-specific elements with regards to the company's current project.

Whilst there is no denying the importance and significance of the site induction carried out by a construction company, the efficiency and effective implementation in practice contain major obstacles. Managing time and cost effectively provide simple indicators for measuring project success. The replication of site inductions can result in substantial lost time, "Willmott Dixon has estimated that each person working on its sites was inducted between four and 20 times per year. The time lost by site managers giving duplicate inductions, across all the contractor's sites, added up to over £1.2m of unnecessary costs" (O'Neile, 2016). Koehn and Wilson (2000) identify safety management is a method of manipulating on-site safety policies, procedures, and practices relating to a construction project, there is no investigative data on effectiveness of safety management on these factors.

Attitudes and behaviour

Attitude and behaviour, are set by policies in place but also the practice of implementation (Kinesa *et al*., 2005). Seeing the policy being carried out in practice from the very start, through showing concern for others, leads to trust in the alignment between site practice and organisational policy statements on health and safety (Sarkus, 1996). Setting the appropriate values and expected behaviours is an essential factor in establishing improved safety performance (Wamuziri, 2015).

In addition, Walumbwa *et al*., (2010), Cooper (2015) identified that leaders creating a supportive environment could exert strong influence on employee engagement, safety behaviour and incident reduction. However, leadership needs to avoid becoming too informal to avoid lapses in safety standards (Zhou and Jiang, 2015). Edwards and Edwards (2013) identify that word of mouth feedback of participants (site induction practice) leads to other sub-contractors coming to site with a pre disposed attitude and expectations. Therefore, the impact of the time spent on induction can reach beyond the immediate site behaviour.

When reviewing transformational leadership Donovan *et al*., (2016) state that the reason that transformational leadership has a positive influence on health and safety is due to the added trust and their safety participation which adds to the employee's safety compliance. Lekka and Healey (2012) have concluded that a positive safety culture combined with a

strong trust between managers and employees results in better practices. A characteristic of both transactional and transformative leadership is the strength and values as a leader to "not turn a blind eye" to unacceptable practices. Given the complexities of leadership in practice and the abilities of individuals to adopt and apply a leadership model that describes their approach, it is possible to deduce that whilst leadership style has a bearing on site practice and behaviour it is important for all of those with a leadership, management or supervisory role to take responsibility in active and positive promotion of safe working practices, commencing with the first point of contact at the site induction.

Technology implementation (e.g. CSCS)

Even with advancements in the Health and Safety sector in recent years, it is still frequently found that construction companies/projects are typically using paper-based site induction methods to record the inspection results of site-workers' certificates of training. Currently 6% of contractors are using smart technology and 69% still reliant on paper-based system entirely (O'Neile, 2016)). 'CSCS SmartCards' (Construction Skills Certification Scheme) system promotes itself as an alternative approach to accessing key data confirming the identity of the person, attained qualifications or training certifying they are fit to carry out that certain job/task and the expiration date of the card affirming the qualifications or training that has been passed. The 'SmartCards' system digitally checks the same criteria as a paper-based system. The information recorded is accessible and can be revised in 'real time', limiting the possibility of out-of-date information being displayed or checked enabling, for example, previous inductions undertaken and toolbox talks to be readily added.

The introduction of BIM - PAS 1192-6 Specification for collaborative sharing and use of structured hazard and risk information for Health and Safety also provides greater opportunities to use technology as an embedded part of safety education and training on sites as more organisations engage with BIM. Whilst PAS 1192-6 is still a draft and available for consultation, the process suggested is expected to address the variable quality of health and safety systems and deal with 'foreseeable risk' at all stages of the project. In particular a visualisation model of the project can be used to review, assess and communicate construction options, hazards and risks in a more easily understood method. Whilst the tools and capability are available for increased use of technology in practice that can also support productivity increases (Hammad *et al*., 2012) the uptake can be described as slow for a number of reasons (Armstrong and Gilge, 2016).

Studies mainly emphasise the principles rather than practices. Therefore, there is a requirement to study through observation and evaluation site induction in practice to understand issues around trade-offs, attitudes and technology application.

METHODOLOGY/DATA COLLECTION

The case study involves a privately-owned group of companies working in infrastructure, support services and construction throughout the UK that employs over 1450 people. A mixed method approach was used, incorporating quantitative observational methods of data collection and analysis and qualitative literature review and individual interviews, to establish a breadth and depth of understanding and corroboration (Creswell and Clark 2011). The study was framed around understanding the execution of organisation policy in practice in relation to Health and Safety. The first stage of data collection was focused on a community campus project of just under £40 million. This project was one of a series of PFI projects with the same principal contractor of a similar type within a five year period. At the time of the study, 3 projects led by the principal contractor were

running concurrently in the same geographical location. There were many sub-contractors working on the case study project, all of whom had to be inducted by a staff member from the principal contractor. Many of these subcontractors were working across other sites for this principal contactor. These inductions were observed over a 5 week period to examine the context, content and duration of the induction processes. This was followed by five Semi Structured interviews undertaken with construction professionals working across the principal contractor. These interviews were undertaken with employees serving different functions e.g. General Manager, Site Manager, H&S Manager. Document examples and templates of on-site induction paperwork and health and safety documents such as risk assessments, method statements and permits were also analysed.

RESULTS

Stage 1 Observation on community campus project site

The principal contractor currently operates what they believe is an effective site induction, typically lasting 30 - 45 minutes. Site inductions take place every morning at 8.30 AM and are conducted by one of the Site Managers, either the Senior Site Manager or the Assistant Site Manager. The induction covers the following: general health and safety aspects of construction such as the use of PPE and working at height; aspects of the company and health and safety relevant to every site they operate such as their environmental policy and commitment to the Considerate Constructor Scheme. Site specific issues such as site layout, specific health and safety concerns for the site and the first aiders currently working on the site. Time taken to deliver inductions by the principal contractor was recorded for 5 weeks. An example of 1 week's observation is shown in Table 1.

Table 1: Recorded time for site manager induction activities

Day	Task	Time Spent (mins)	Total (mins)
Monday	Preparation for week's Inductions	20	
	Induction	40	60
Tuesday	Induction	35	35
Wednesday	Update of Induction PowerPoint	20	
	Induction	45	
	Late Comer Induction	30	95
Thursday	Induction	35	
	Late Comer Induction	30	65
Friday	Induction	45	
	Record Week's Inductees	50	95
Total (hours)			5.83

The principal contractors' allocation for this specific induction activity was 5 hrs a week. Over 5 weeks of observations the time spent on induction was between 5.83 - 6hrs. This is a variation of between 16% and 20% between allocated and observed time. The observations indicate that there was 1 hour of 'lost' time in one week for late arrivals. Based on this indication, this amount of lost time scaled up over 10 sites over a year lead to a substantial sum of lost time and associated costs. A second observation is that the

shortest time for induction was 35 minutes, with longest 45 minutes. It is not clear whether this extended time is because of lost time or long Q&A. There is a consequence to repeating or delayed inductions for late arrivals. However, if the principal contractor does not repeat the induction, the contractor is unable to start work until the next scheduled induction. The principal contractor has to accept the fact that there will be lost time. The main issue becomes the awareness of how much time is really lost in practice and by whom.

Stage 2 Semi Structured interviews across the company
The purpose of the semi structured interviews was to establish views on the current approach to induction, problems and areas for improvement.

The semi structured interviews focused on addressing the following questions:

- What is the current site induction procedure is undertaken by the company?
- What is your opinion of the current site induction procedure carried out by your company?
- What improvements do you feel that should be made to improve this site induction process?
- What impact would an electronic database as a checklist for general site inductions have for your role?
- What do you think would improve the efficiency of the currently implemented site induction method?

The responses were transcribed and analysed by thematic analysis (Braun and Clarke 2006) into 3 themes:

- Adapting to technology - collection of statements covering video clips, DVDs, use of internet for pre-site induction and the SmartCard system
- Improvements to existing systems - various areas where practical suggestions made or observations on current practice based on experience of existing systems for site induction
- Problems - areas where existing problems as well as those for improvements can be foreseen, recognising the need to maintain flexibility yet achieve health and safety objectives

A selection of illustrative quotes are presented within the themes in Table 2 for Senior Roles and Table 3 for Operational Roles and discussed in the next section.

DISCUSSION

The findings of the interviews reflects the Senior Roles and their focus on managing systems in practice. The ability to identify and articulate the problems and potential improvements indicates an overview of the project and organisational context, typically recognising the complexity of the problem. There is also recognition between the need for policy and system control to be balanced with the needs for operational commitment, “What do you do when guys turn up onto your site who don’t have CSCS? Do you turn them away? How do you deal with that because that’s what happens in the real world”. The overview also indicates an appreciation for the benefits of technology combined with a critical evaluation of the limitations. A desire to use the tried and tested methods that work indicates a similar outcome to the study of Armstrong and Gilge (2016) into the adoption of technology within construction. One option to reduce lost time is to make site inductions more proportionate to the needs of the person being inducted. For example, a sub-contractor working for the same principal contractor across 3 sites where electronic records are shared, only requires a full general introduction to the health & safety

protocol implemented by the company once for the first site they work on, with two further inductions requiring only site specific information.

Table 2: Senior Role Theme Comments

Theme	Adapting to technology	Improvements to existing systems	Problems
Site Manager		There are obviously improvements that can be made… along with the DVD make a recording of the project manager or site manager of that specific site going through the site specifics. There should be a system where information is provided before they even turn up on site, so that we can then verify it, have it logged…know who's got a card and if they have been to any of our inductions before	You end up getting into a process of inducting everybody all the time, which can take up quite a lot of time in your day. There is the monotony of constantly having to do these inductions. You kind of lose the emphasis of what's important in it sometimes because you do it so often and it just rolls of your tongue and there's always the opportunity to miss sections.
General Manager	In an ideal world…before anyone comes to the site they have been online and logged in their tickets, their CSCS, CPCS or their NPORS or whatever they've got and they are checked automatically. As part of that process, they could also receive the general part of the induction online before they come to my site to save some time, but whether that works or not I don't know, I know it's something that we are looking at.	…what I would like to see, is a pre-registration system but with more controls on it … but it's hard enough to get the method statements and risk assessments off of companies before they arrive on-site. We have to have a system that works for everybody and is flexible … or we have to be strong enough to turn people away but that impacts on us. It's about making sure they know the values and the behaviours that we are trying to put in place.	The downside to [on-line induction] is that you don't know, who watched the video, was that actually the person that is coming to site? It's hard to control that and I don't know what controls we could put in place to do that. Companies will say only CSCS or we're going to use a CSCS database. What do you do when guys turn up onto your site who don't have CSCS? Do you turn them away? How do you deal with that because that's what happens in the real world
Project Manager	I have seen a card system where guys who have been inducted within a company, they are then valid to go work on other same-company sites and only require the site-specific induction.	If you are sat with a bunch of slides and it's just somebody reading through them, it can be fairly boring and monotonous. A video version which was eye-catching … makes it more interesting. 9 times out of 10, they've lost their CPCS/CSCS card and you have to go on Card checker online and maybe there is a way of centralising the database within the company	It is a standard induction used across all projects … if you are somebody that comes and goes through a lot of projects and inductions, you hear the same thing and probably tend to switch off

There is recognition that repetition in of induction can lead to monotony and switch off for all involved. There is evidence that discussions, comments and feedback between

participants in learning experiences (such as site inductions) leads to different levels of engagement and behaviour for subsequent participants (Edwards and Edwards, 2013).

Table 3: Operational Role Theme Comments

Theme	Adapting to technology	Improvements to existing systems	Problems
H&S Manager	I would perhaps, go down the lines of a safety passport … quite a lot of companies have a safety passport which lasts for a year and an electronic system to track that.	The previous DVD was from about 9-10 years ago and was quite dated in some of the methodology and the ethos behind health and safety was different those days so the message wasn't quite up-to-date. The safety passport is being explored currently, because one of the aims is that we would like to be able to track people so they don't have to sit through the 15 minute group message every time.	Because there are a number of foreign tradesmen… on-line induction material has also been converted so we cover most of the people on site. We are so close to [specific location] there is also a separate environmental induction because we are in such a sensitive area.
Site Engineer	There's an induction prior to anybody going out on site and is delivered via a video followed by site-specific verbal induction.	I think inductions should be site-specific to your job role rather than other things that sometimes lose their attention. I think it [centralised electronic database] would be beneficial and a better format to keep track of the guy's records and to go on and check their training and competency.	

The impact of prioritising safety and taking the appropriate time has an impact beyond the site, as 'word-of-mouth' reinforces the expected health and safety standards. The Senior Roles not only recognise this problem in themselves and for others but have a genuine desire to ensure the appropriate values and behaviours towards health and safety are evident. "We don't spend enough time … the culture of safety is …it really is about them. It's about making sure they know the values and the behaviours that we are trying to put in place". The main issue here is recognition that while the CSCS Smartcard system is being publicised as a solution it clearly does not address the reality of complex problems, "Companies will say only CSCS or we're going to use a CSCS database. What do you do on when guys turn up onto your site who don't have CSCS? are we making the industry only for the people who can afford the CSCS? That is a concern". Some of the claims indicate administrative time-saving opportunities (O'Neile 2016) are indicative of the information being presented but don't address the operational issues identified by these managers in practice.

The responses from the Operational Roles clearly identify with operational improvements. Issues with a greater response focus on where the practical application of

technology or system improvement can be seen (Safety Passport and CSCS Scanner). Whilst these options appear useful, the appreciation shown by Senior Roles of system failures in the technology is not evident in relation to, for example, card systems other than CSCS. Operational Roles indicate the need for information capture and recording, but unlike the more Senior Roles there is no indication that the function is about behaviours and attitudes, which may be because of the job role and focus being on productive work and meeting system needs for recording activity in induction. The lack of consideration of problems also reflects the typical requirements of the roles of the site engineer and section manager as 'can do' people that solve problems. These roles deal with problems as they come along and getting on with the existing systems in place to make them work as best they can.

The length of induction may be a result of the needs of the person(s) being inducted but also dependent on a number of factors influencing the deliverer's time and ability to provide the induction. There are operatives and professionals with varying degrees of site experience and knowledge and visitors that will be exposed to fewer risks. One option is to make site inductions more proportionate to the needs of the person(s) being inducted. Technology has been presented as an opportunity to reduce the amount of lost time in the induction process by targeting the right level of induction. Senior Roles are aware of potential opportunities to spend less time through technology but each solution has limitations as discussed above.

CONCLUSION

This paper investigated site induction activities in practice to better understand the operational demands on time for those involved in managing site inductions and the impact of this activity on safety behaviour on site. The observational data examined the trade-offs and weightings between time losses/benefits, safety in practice, and technology implementation.

Trade-offs and weightings between time losses/benefits

The mandatory nature of site inductions means that those with a leadership role responsible for delivery recognise them as a priority. This is without a full appreciation of the time involved. There is clear evidence that there is more principal contractor time spent in relation to the induction process for health and safety arising from the actual induction itself and the associated administrative processes than planned. The cumulative impact of this 1 hr of "lost time" per week multiplied across the year over a number of sites can be described as 'substantial'. However, both the principal contractor and sub-contractors recognise the value and benefits of effective site safety induction, which leads to associated appropriate site behaviour. The impact of prioritising safety and taking the appropriate time has an impact beyond the site as 'word-of-mouth' reinforces the expected health and safety standards.

Technology implementation and administrative processes

Technology has been presented as an opportunity to reduce the amount of lost time in the induction process by targeting the right level of induction. Our study revealed that the site induction deliverers are aware of potential opportunities to spend less time on this activity but each solution has limitations. For example, opportunities for savings through technology include, pre-registration, off-site videos and sharing of existing site inductions across sites but the data still needs to be created, current and have a reliable authentication process. Those with a leadership role have indicated that there are difficulties in keeping up with the pace of change in technology development for this purpose. The issue of

keeping pace with changes in technology is recognised as an industry-wide problem, in particular, for implementing BIM.

Safety practices on construction sites and attitudes and behaviours.
The principal contractor as an organisation expects their managers to lead by example, which is why they prioritise site induction so that people understand it is valued, creating a solid reputation for appropriate site behaviour. Putting into practice the claims of the company policy leads to trust between site staff and managers. Senior Roles demonstrated a genuine desire to ensure the appropriate values and behaviours towards health and safety are evident. This recognises that if leaders do not exhibit the expected leadership example, this will undermine the attitudes and behaviour on site on the basis that the leadership supports a less than rigorous approach. Operational Roles indicated the need for information capture and recording however there was less recognition that the function of induction was about behaviours and attitudes.

The application of observations has allowed us to identify the actual time commitment of leadership in practice. The principal contractor's allocated time for providing and undertaking site induction activities was underestimated by 16% to 20%. The interviews identified the potential to save time through fuller exploitation of existing and new technology solutions. However, those with a leadership role indicated difficulties in keeping up with the pace of change in technology development for health and safety induction and there were also operational issues in practice.

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